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Sampling and Analysis Plan for Support Activities to the 200-UW-1 Operable Unit

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management



**United States
Department of Energy**
P.O. Box 550
Richland, Washington 99352

**Approved for Public Release;
Further Dissemination Unlimited**

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Date Published
November 2005

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P.O. Box 550
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J. D. Cardal
Release Approval 11/30/2005
Date

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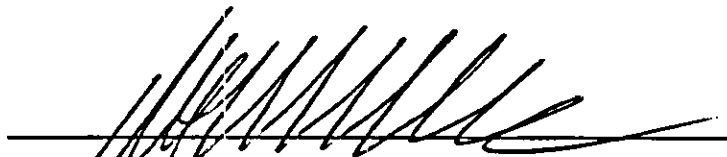
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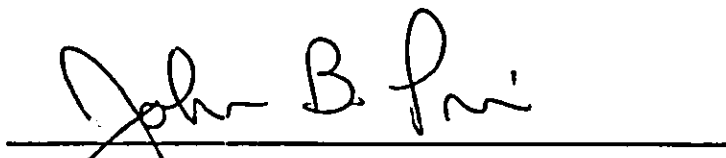
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APPROVALS


DOE/RL-2005-75, *Sampling and Analysis Plan for Support Activities to the 200-UW-1 Operable Unit*, Rev. 0


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EXECUTIVE SUMMARY

This sampling and analysis plan (SAP) defines the approach to conduct characterization sampling at the 200-W-42 Vitrified Clay Pipe (VCP) waste site, located in the 200 West Area in the 200-UW-1 Operable Unit (OU). In addition, sampling will be performed on crib vent risers, a concrete pad, and a portion of the Treated Effluent Disposal Facility (TEDF) pipeline. The latter three efforts support the overall goal of removing a portion of the VCP, and support the proposed placement of engineered barriers over the 216-U-8 and 216-U-12 Cribs. The sampling and removal tasks are collectively referred to hereafter as the 200-UW-1 OU Support Activities project.

The U.S. Department of Energy prepared a focused feasibility study (DOE/RL-2003-23, *Focused Feasibility Study for the 200-UW-1 Operable Unit*¹) and associated proposed plan (DOE/RL-2003-24, *Proposed Plan for the 200-UW-1 Operable Unit*²) that defined the preferred remedial actions for the waste sites in the 200-UW-1 OU. A record of decision is currently being prepared to select the remedial alternative for the waste sites.

However, this SAP is being prepared before the record of decision, so that a portion of the 200-W-42 VCP can be removed to facilitate placement of an engineered barrier over the 216-U-8 and 216-U-12 Cribs by September 30, 2006. In conjunction with preparation of the data quality objectives summary report (CP-26827, *Data Quality Objectives Summary Report for Support Activities to the 200-UW-1 Operable Unit*³) and this SAP, a time-critical removal action memorandum (DOE/RL-2005-71, *Action Memorandum for the Time-Critical Removal Action for Support Activities to the 200-UW-1 Operable Unit*⁴), and removal action work plan

¹DOE/RL-2003-23, 2005, *Focused Feasibility Study for the 200-UW-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

²DOE/RL-2003-24, 2005, *Proposed Plan for the 200-UW-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

³CP-26827, 2005, *Data Quality Objectives Summary Report for Support Activities to the 200-UW-1 Operable Unit*, Rev. 0, Fluor Hanford, Inc., Richland, Washington.

⁴DOE/RL-2005-71, 2005, *Action Memorandum for the Time-Critical Removal Action for Support Activities to the 200-UW-1 Operable Unit*, Rev. C, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

(DOE/RL-2005-78, *Support Activities to the 200-UW-1 Operable Unit Removal Action Work Plan*⁵) are being prepared for the 200-UW-1 OU Support Activities project.

This SAP defines the approach to conduct characterization sampling at the 200-W-42 VCP, and additional locations (TEDF pipeline, concrete pad, and crib vent risers) in the 200-UW-1 OU. The sampling strategy for the 200-UW-1 OU Support Activities project is presented in Chapter 3.0 of this SAP.

The overall goals of the sampling identified in this SAP are to provide the data needed to support waste disposal from excavating the VCP, confirm the selected remedial action for the 200-W-42 VCP, and verify that cleanup goals are attained for the excavated area. The preferred remedial action under consideration for this waste site, as identified in the focused feasibility study (DOE/RL-2003-23), is Alternative 3 – Removal, Treatment, and Disposal. The U.S. Environmental Protection Agency's data quality objective guidance⁶ was used to identify project data quality needs, evaluate sampling and analysis options, and document project data quality decisions.

The following sampling strategy was developed based on current site knowledge and likely site remedial actions.

- For this removal, treatment, and disposal site, field radiological surveys will be used to define the areas of highest contamination in the soil surrounding the VCP. The presence of cesium-137 detected during field surveys will be used as a "tracer" to determine areas that require further sampling and analysis. Those areas with detectable radiological contamination will be flagged for collection of samples.
- For the pipeline itself, sampling is needed to confirm that contaminants remaining within the pipeline, or sorbed in the clay, meet the waste acceptance criteria for the disposal

⁵DOE/RL-2005-78, 2005, *Support Activities to the 200-UW-1 Operable Unit Removal Action Work Plan*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

⁶EPA/600/R-96/055, 2000, *Guidance for the Data Quality Objectives Process*, EPA QA/G-4, U.S. Environmental Protection Agency, Washington, D.C.

facility. As noted in the first bullet, cesium-137 will be used as a tracer to determine areas that require further sampling and analysis. .

- For the crib risers, radiological smear samples will be taken from each riser and positive contamination detected with field instruments will be further analyzed at the laboratory. As noted in the first bullet, cesium-137 will be used as a tracer to determine areas that require further sampling and analysis.
- For the concrete pad, a series of randomly selected areas will be sampled to characterize the waste for disposal purposes.
- For the TEDF pipeline, because no radiological or nonradiological constituents are expected to be present, radiological field samples will be analyzed to confirm process knowledge. Field samples with detectable radiological contamination will be sent to the laboratory for further analysis.
- Physical sample collection options for the 200-UW-1 OU Support Activities project may include, but are not limited to, soil grab samples (or the use of other soil sample collection methods), concrete core sampling, and radiological smear samples. Field-screening data collection options may include visual inspection of the pipeline, and radioisotope testing equipment (Geiger-Mueller meter, and portable sodium iodide detector).

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TERMS

AEA	alpha energy analysis
CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980</i>
CFR	<i>Code of Federal Regulations</i>
Ci	curie
COC	contaminant of concern
COPC	contaminant of potential concern
CWC	Central Waste Complex
d/min	disintegrations per minute
DOE	U.S. Department of Energy
DQO	data quality objective
DR	decision rule
Ecology	Washington State Department of Ecology
EIS	Environmental Information System
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
FFS	focused feasibility study
ft	feet
GEA	gamma energy analysis
GeLi	germanium-lithium
HEIS	<i>Hanford Environmental Information System</i> database
HPGe	high-purity germanium
m	meter
mg/kg	milligram(s) per kilogram
N/A	not applicable
NWTPH-D	Northwest total petroleum hydrocarbon – diesel
OU	operable unit
PCB	polychlorinated biphenyl
pCi/g	picocuries per gram
PNNL	Pacific Northwest National Laboratory
QAPjP	quality assurance project plan
QC	quality control
PLM	polarized light microscopy
RL	U.S. Department of Energy, Richland Operations Office
RPD	relative percent difference
SAP	sampling and analysis plan
TEDF	Treated Effluent Disposal Facility
VCP	vitrified clay pipe
WAC	<i>Washington Administrative Code</i>
WSCF	Waste Sampling and Characterization Facility

METRIC CONVERSION CHART

Into Metric Units			Out of Metric Units		
<i>If You Know</i>	<i>Multiply By</i>	<i>To Get</i>	<i>If You Know</i>	<i>Multiply By</i>	<i>To Get</i>
Length			Length		
inches	25.4	Millimeters	millimeters	0.039	inches
inches	2.54	Centimeters	centimeters	0.394	inches
feet	0.305	Meters	meters	3.281	feet
yards	0.914	Meters	meters	1.094	yards
miles	1.609	Kilometers	kilometers	0.621	miles
Area			Area		
sq. inches	6.452	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.093	sq. meters	sq. meters	10.76	sq. feet
sq. yards	0.0836	sq. meters	sq. meters	1.196	sq. yards
sq. miles	2.6	sq. kilometers	sq. kilometers	0.4	sq. miles
acres	0.405	Hectares	hectares	2.47	acres
Mass (weight)			Mass (weight)		
ounces	28.35	Grams	grams	0.035	ounces
pounds	0.454	Kilograms	kilograms	2.205	pounds
ton	0.907	metric ton	metric ton	1.102	ton
Volume			Volume		
teaspoons	5	Milliliters	milliliters	0.033	fluid ounces
tablespoons	15	Milliliters	liters	2.1	pints
fluid ounces	30	Milliliters	liters	1.057	quarts
cups	0.24	Liters	liters	0.264	gallons
pints	0.47	Liters	cubic meters	35.315	cubic feet
quarts	0.95	Liters	cubic meters	1.308	cubic yards
gallons	3.8	Liters			
cubic feet	0.028	cubic meters			
cubic yards	0.765	cubic meters			
Temperature			Temperature		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius	Celsius	multiply by 9/5, then add 32	Fahrenheit
Radioactivity			Radioactivity		
picocuries	37	Millibecquerel	millibecquerel	0.027	picocuries

1.0 INTRODUCTION

The Hanford Site (Figure 1-1) is a 1,517 km² (586 mi²) Federal facility located in southeastern Washington State along the Columbia River. From 1943 to 1990, the primary mission of the Hanford Site was the production of nuclear materials for national defense. In July 1989, the 100, 200, 300, and 1100 Areas of the Hanford Site were placed on the National Priorities List (40 *Code of Federal Regulations* [CFR] 300, "National Oil and Hazardous Substances Pollution Contingency Plan," Appendix B, "National Priorities List") pursuant to the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA).

The Central Plateau is located in the central portion of the Hanford Site and is divided into three areas: 200 East Area, 200 West Area, and 200 North Area. Operations in the 200 East and 200 West Areas were related to chemical separation, plutonium and uranium recovery, processing of fission products, and waste partitioning. Major chemical processes in the Central Plateau resulted in delivery of high-activity waste streams to systems of large underground tanks called "tank farms." The liquid wastes often were neutralized before being sent to the tanks and later evaporated (concentrated). The storage tanks were used to allow the heavier constituents to settle from the liquid effluents, forming sludge. Low-activity liquid wastes were discharged to trenches, cribs, drains, and ponds, most of which were unlined. The 200 North Area formerly was used for the interim storage and staging of irradiated fuel.

The 200-UW-1 Operable Unit (OU) (Figure 1-2) addresses 33 soil waste sites. These sites range from being rather small (approximate surface area of 2.7 m² [30 ft²] and 1 m [3 ft] in depth) to very large (approximate surface area of 4,645 m² [50,000 ft²] and 61 m [200 ft] in depth).

The map of the Hanford Site provided in Figure 1-1 depicts the 200 West Area. Figure 1-2 identifies the specific waste sites within the 200-UW-1 OU.

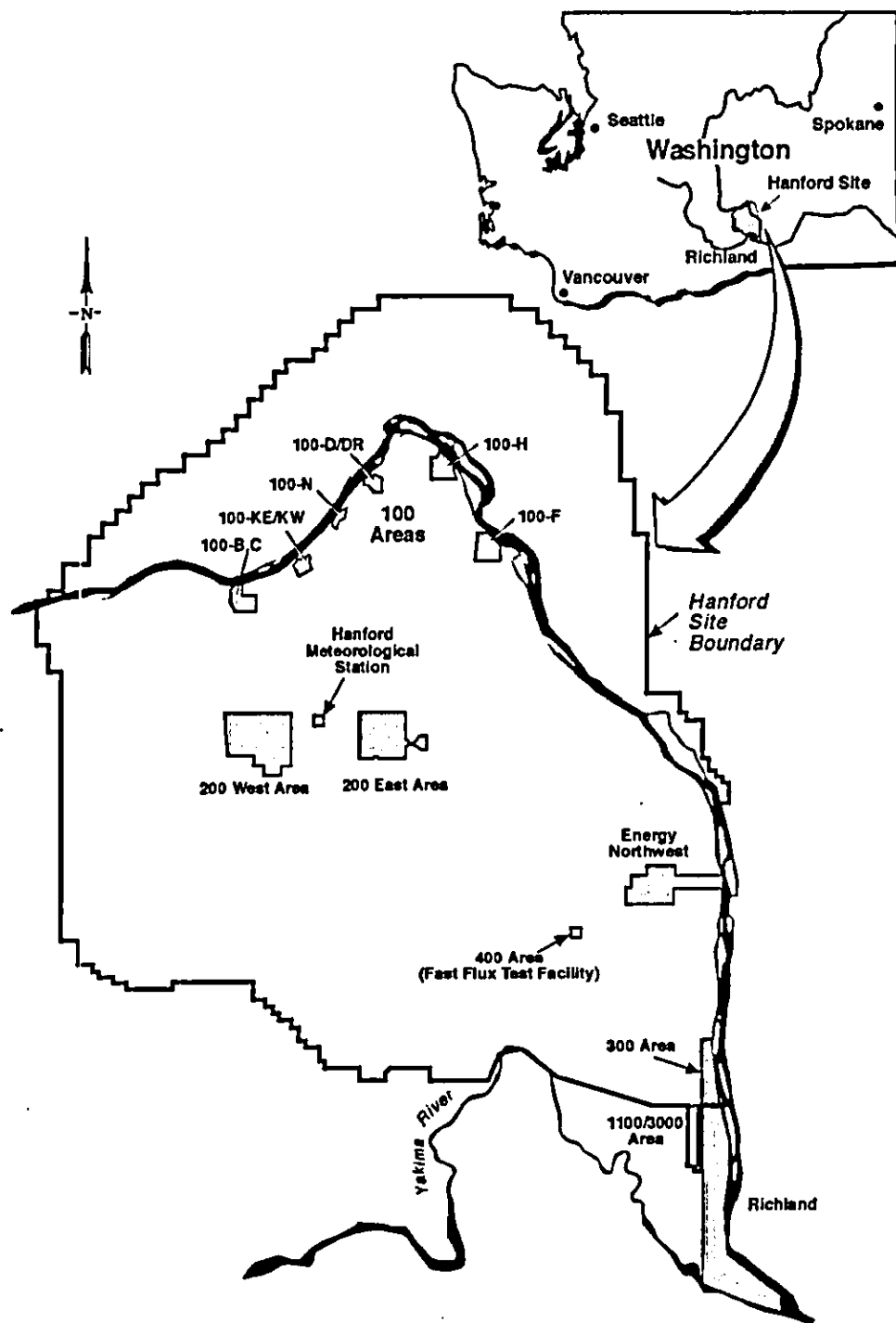
This sampling and analysis plan (SAP) defines the approach to conduct characterization sampling at the 200-W-42 Vitrified Clay Pipe (VCP) waste site, and additional locations (Treated Effluent Disposal Facility [TEDF] pipeline, concrete pad, and crib vent risers) in the 200-UW-1 OU. The sampling strategy for the 200-UW-1 OU Support Activities project is presented in Chapter 3.0 of this SAP.

The overall goals of the sampling identified in this SAP are to provide the data needed to support waste disposal from excavating the VCP, confirm the selected remedial action for the 200-W-42 VCP, and verify that cleanup goals are attained for the excavated area. The summary of data needs for this project is presented in Table 1-1.

1.1 PROJECT SCOPE

This SAP includes sampling of four elements that are being removed to support the proposed engineered barrier installation over the 216-U-8 and 216-U-12 Cribs: a portion of the 200-W-42 VCP, as well as crib vent risers, a concrete pad, and a section of the TEDF pipeline. The sampling and removal tasks are collectively referred to hereafter as the 200-UW-1 OU Support Activities project.

Figure 1-1. Hanford Site and Washington State.



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Table 1-1. Summary of Data Needs. (2 Pages)

Waste Stream	Contaminants of Concern ^a	Contaminants of Potential Concern ^b	Data Needs	Recommended Approach
Vitrified clay pipe	Cesium-137	Nitrogen as nitrite and nitrate, Antimony, Arsenic, Chromium, Mercury, Selenium, Silver, Thallium, Titanium, Uranium (metal), Asbestos, Bis (2-ethylhexyl) phthalate, Di-n-butyl phthalate, Pentachlorophenol, Kerosene, Acetone, Bromomethane, Chloromethane, Methylene Chloride, Toluene, Chloride, Sulfate, Fluoride, Americium-241, Europium-152, Europium-154, Neptunium-237, Plutonium-238, Plutonium-239/240, Radium-226, Radium-228, Strontium-90, Technetium-99, Thorium-232, Uranium-233/234, Uranium-235, Uranium-238, Cesium-134, Selenium-79.	Waste characterization	Focused sampling based on field detection of cesium-137. See Table 3-1 for additional detail.
Excavated soil	Cesium-137	Nitrogen as nitrite and nitrate, Antimony, Arsenic, Chromium, Mercury, Selenium, Silver, Thallium, Titanium, Uranium (metal), Asbestos, Bis (2-ethylhexyl) phthalate, Di-n-butyl phthalate, Pentachlorophenol, Kerosene, Acetone, Bromomethane, Chloromethane, Methylene Chloride, Toluene, Chloride, Sulfate, Fluoride, Americium-241, Europium-152, Europium-154, Neptunium-237, Plutonium-238, Plutonium-239/240, Radium-226, Radium-228, Strontium-90, Technetium-99, Thorium-232, Uranium-233/234, Uranium-235, Uranium-238, Cesium-134, Selenium-79.	Waste characterization; termination data	Focused sampling based on field detection of cesium-137. If no detectable contamination can be located, random sampling will be performed. See Table 3-1 for additional detail.

Table 1-1. Summary of Data Needs. (2 Pages)

Waste Stream	Contaminants of Concern ^a	Contaminants of Potential Concern ^b	Data Needs	Recommended Approach
216-U-8 and 216-U-12 Crib vent risers	Cesium-137	Americium-241, Europium-152, Europium-154, Neptunium-237, Plutonium-238, Plutonium-239/240, Radium-226, Radium-228, Strontium-90, Technetium-99, Thorium-232, Uranium-233/234, Uranium-235, Uranium-238, Cesium-134, Selenium-79.	Waste characterization	Radiological smear sample and laboratory analysis for radiological constituents. See Table 3-1 for additional detail.
Concrete pad near the 216-U-8 and 216-U-12 Crib	Cesium-137	Nitrogen as nitrite and nitrate, Antimony, Arsenic, Chromium, Mercury, Selenium, Silver, Thallium, Titanium, Uranium (metal), Asbestos, Bis (2-ethylhexyl) phthalate, Di-n-butyl phthalate, Pentachlorophenol, Kerosene, Acetone, Bromomethane, Chloromethane, Methylene Chloride, Toluene, Chloride, Sulfate, Fluoride, Americium-241, Europium-152, Europium-154, Neptunium-237, Plutonium-238, Plutonium-239/240, Radium-226, Radium-228, Strontium-90, Technetium-99, Thorium-232, Uranium-233/234, Uranium-235, Uranium-238, Cesium-134, Selenium-79.	Waste characterization	Random sampling of gridded concrete pad. See Table 3-1 for additional detail.
Treated Effluent Disposal Facility pipeline	N/A	Americium-241, Europium-152, Europium-154, Neptunium-237, Plutonium-238, Plutonium-239/240, Radium-226, Radium-228, Strontium-90, Technetium-99, Thorium-232, Uranium-233/234, Uranium-235, Uranium-238, Cesium-134, Selenium-79, Cesium-137.	Waste characterization; verification of process knowledge	Radiological smear sample to verify process knowledge. See Table 3-1 for additional detail.

^aContaminants of concern for representative sites were identified in the DOE/RL-2003-23, *Focused Feasibility Study for the 200-UW-1 Operable Unit*, risk assessment process.

^bContaminants of potential concern were identified based on process knowledge and past sampling and analysis data.

N/A = not applicable.

The scope of this project includes the data quality objective (DQO) process and development of this SAP for the 200-UW-1 OU Support Activities project to confirm the preferred remedial action for the 200-W-42 VCP waste site, support future remediation of the remainder of the 200-W-42 VCP, and provide characterization data for waste disposal. Overall sampling efforts for the 200-UW-1 OU Support Activities project include the following:

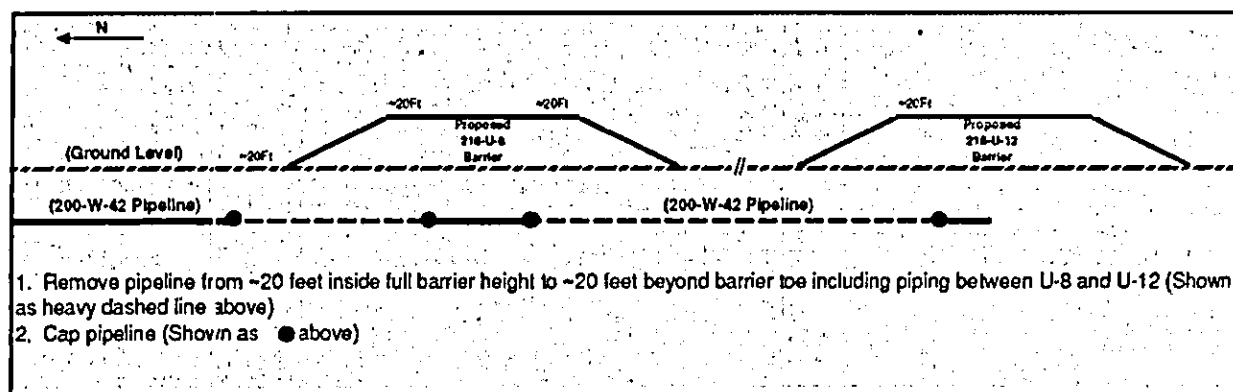
- Waste characterization sampling. Data collection for waste materials (i.e., VCP, soil, concrete, steel piping) to ensure compliance with Environmental Restoration Disposal Facility (ERDF) waste acceptance criteria (BHI-00139, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*).
- Site closeout sampling. Data collection to verify that the bottom of the excavation at the 200-W-42 VCP attains cleanup goals.
- Remedy confirmation sampling. Data collection to confirm that the site conceptual model for the 200-W-42 pipeline agrees with the site conceptual model used to recommend the preferred remedial alternative.

For the 200-UW-1 OU Support Activities project, sampling will be accomplished before the 200-UW-1 OU record of decision is issued to support removal of the pipeline in time to allow the proposed construction of an engineered barrier by September 30, 2006. The DQO summary report (CP-26827, *Data Quality Objectives Summary Report for Support Activities to the 200-UW-1 Operable Unit*) and this SAP were prepared concurrently with a time-critical removal action memorandum (DOE/RL-2005-71, *Action Memorandum for the Time-Critical Removal Action for Support Activities to the 200-UW-1 Operable Unit*) and removal action work plan (DOE/RL-2005-78, *Support Activities to the 200-UW-1 Operable Unit Removal Action Work Plan*).

To support the 200-UW-1 OU Support Activities project to install engineered barriers over the 216-U-8 and 216-U-12 Cribs (Figure 1-3), the following actions are addressed under the time-critical removal action memorandum (DOE/RL-2005-71), the removal action work plan (DOE/RL-2005-78), and this SAP.

- Excavate approximately 122 m (400 ft) of the 200-W-42 VCP, which is approximately half of the total length of the pipeline, sample the pipeline trench, and backfill the trench area (sampling of the trench will provide characterization data that will be of use for other removal and remedial activities, such as the groundwater and the 200-UW-1 OU projects).
- Reroute approximately 253 m (830 ft) of the TEDF wastewater pipeline and remove approximately 31 m (100 ft) of the pipeline.
- Remove a 31 by 46 m (100- by 150-ft) concrete slab.
- Remove and seal three crib vent risers.
- Relocate any miscellaneous markers or utilities.

Figure 1-3. Proposed Construction of Crib Barriers (i.e., 216-U-8 and 216-U-12) and Removal, Treatment, and Disposal of 200-W-42 Vitrified Clay Pipe Waste Site.



1.2 PROJECT GOALS

The goals of this project are: (1) Use historical and process knowledge to the maximum extent practical to identify the chemical and radiological hazards within and around the 200-W-42 VCP; (2) Determine if existing data are sufficient to characterize waste materials for disposal at the ERDF in the 200 West Area; (3) Identify the waste streams that will be generated during the removal action, including the VCP, soil, TEDF piping, concrete slab, and risers; (4) Establish sampling and analytical requirements for any materials needing additional characterization; (5) Remove sections of the 200-W-42 VCP in accordance with the preferred alternative selected through the focused feasibility study (FFS) process; (6) Perform all activities in a manner that is protective of human health and the environment.

1.3 PROJECT ASSUMPTIONS

The following project assumptions are based on project team discussions from regular team meetings and input received during the DQO scoping checklist review. In addition, interviews with the key decision makers were held to provide a forum for eliciting ideas and issues for inclusion in the DQO process.

1. The project has historical characterization data (BHI-00033, *Surface and Near Surface Field Investigation Data Summary Report for the 200-UP-2 Operable Unit* and BHI-00034, *Borehole Summary Report for the 200-UP-2 Operable Unit, 200 West Area*) associated with the past investigations associated with the 200-W-42 VCP and the 216-U-8 and 216-U-12 Cribs. The data have been used to establish the primary sources of contamination and to support the determination of the list of contaminants of concern (COC). These data are analyzed in DOE/RL-2003-23, *Focused Feasibility Study for the 200-UW-1 Operable Unit* (FFS). The list of contaminants of potential concern (COPC) and COCs derived from the FFS is presented in the DQO summary report (CP-26827) and this SAP.

2. The 200-W-42 VCP is not anticipated to contain substantial amounts of free liquid, but may contain scale and/or sludge that could be sampled.
3. A concrete pad and three risers associated with the 216-U-8 and 216-U-12 Cribs also will be dispositioned as part of this removal action. Sampling of these waste items will be required to aid with waste profiling and designation, and to ensure that the ERDF waste acceptance criteria (BHI-00139) are met.
4. Rerouting of the TEDF pipeline is anticipated to result in generation of waste (i.e., portions of steel pipe) that will be disposed of as part of this project. Because the TEDF pipeline is administratively controlled to ensure that hazardous and radiological waste is not discharged to this pipeline, only confirmatory radiological field surveys and laboratory sampling are anticipated to be required to characterize the waste.
5. Based on existing information, soil and/or debris removed from this waste site are not anticipated to require ex situ treatment to meet disposal requirements at the ERDF or to reduce waste volumes. Contaminated soil will be containerized on site and transported to the ERDF, located near the U Plant Area in the 200 West Area. Low-level radioactive waste and/or hazardous waste are acceptable for disposal at the ERDF, in accordance with the waste acceptance criteria (BHI-00139).
6. Pipeline composition (e.g., vitrified clay) and integrity (i.e., collapsed or structurally sound) also would be considered in making sampling decisions.
7. After the clean cover and contaminated soil are removed, uncontaminated soil would be used to backfill the excavation. The backfill material likely will come from the ERDF spoils pile.
8. The final disposition of the adjacent cribs (216-U-8 and 216-U-12) is not within the scope of the DQO summary report (CP-26827) or this SAP. These cribs are discussed in these documents because the 200-W-42 VCP carried waste to the cribs. Final disposition of the cribs will be documented in a record of decision prepared for the remaining waste sites within the 200-UW-1 OU.

1.4 200-W-42 VITRIFIED CLAY PIPE CONTAMINANTS

As shown by the risk assessment in the 200-UW-1 FFS, the 200-W-42 VCP waste site is contaminated with Cs-137 (COC) at levels that represent human health direct exposure and terrestrial wildlife exposure. Based on discussions with the U.S. Department of Energy, Richland Operations Office (RL) and the Washington State Department of Ecology (Ecology), sampling activities will include analysis for Cs-137 as a COC and analyses for those contaminants listed in the FFS as COPCs. The combined list of contaminants is presented in Table 1-2, and their corresponding action levels listed in Table 2-1.

Table 1-2. 200-W-42 Vittrified Clay Pipe Contaminants of Potential Concern and Contaminants of Concern.

Nonradioactive Contaminants	Radioactive Contaminants
Nitrogen as nitrite and nitrate	Americium-241
Antimony	Cesium-137
Arsenic	Europium-152
Chromium	Europium-154
Mercury	Neptunium-237
Selenium	Plutonium-238
Silver	Plutonium-239/240
Thallium	Radium-226
Titanium	Radium-228
Uranium (metal)	Strontium-90
Asbestos (contained in vitrified clay pipe only)	Technetium-99
Bis (2-ethylhexyl) phthalate	Thorium-232
Di-n-butyl phthalate	Uranium-233/234
Pentachlorophenol	Uranium-235
Kerosene	Uranium-238
Acetone	Cesium-134
Bromomethane	Selenium-79
Chloromethane	
Methylene chloride	
Toluene	
Chloride	
Sulfate	
Fluoride	

1.5 DATA QUALITY OBJECTIVES

EPA/600/R-96/055, *Guidance for the Data Quality Objectives Process*, EPA QA/G-4, was used to support the development of this SAP. The DQO process is a strategic planning approach that provides a systematic process for defining the criteria that a data collection design should satisfy. Using the DQO process ensures that the type, quantity, and quality of environmental data used in decision making will be appropriate for the intended application.

This section summarizes the key outputs resulting from the implementation of the seven-step DQO process. For additional details, refer to CP-26827.

1.5.1 Statement of the Problem

Characterization data are needed to support waste (soil, VCP, concrete rubble, steel pipe) disposal in the ERDF. Process knowledge, as well as field sampling and laboratory analytical data regarding the concentrations of radiological and chemical constituents, are needed for waste profiling and designation, and to ensure compliance with the disposal facilities' waste acceptance criteria.

In addition, verification sample data are needed to ensure that removal action objectives (as identified in the removal action work plan [DOE/RL-2005-78]) have been met following excavation of the 200-W-42 VCP site.

1.5.2 Decision Rules

Decision rules are developed during the DQO process and generally are structured as "IF...THEN" statements that indicate the action that would be taken when a prescribed waste site condition is met. Decision rules incorporate the parameters of interest (COCs and COPCs), the scale of the decision (waste site boundaries), the action level (risk-based criteria), and the resulting action (remediation needs). The decision rules are summarized in Table 1-3.

Table 1-3. Decision Rules. (2 Pages)

DR #	Decision Rules
1	<p>If process knowledge or the maximum sample concentration for contaminated materials is determined to exceed the ERDF waste acceptance criteria, then the materials will be evaluated for storage at the CWC in accordance with DR #2 through DR #8, as applicable.</p> <p>If process knowledge or the maximum sample concentration for contaminated materials is determined to not exceed the final action levels, then the materials will be evaluated for disposal at the ERDF in accordance with DR #2 through DR #8, as applicable.</p>
2 – 8*	<p>If process knowledge or the maximum sample concentration for contaminated materials indicates that the materials are to be designated as listed, characteristic, toxic, persistent, PCB, or asbestos-containing material, then materials will be evaluated for treatment or disposal at the ERDF, or storage at the CWC in accordance with DR #9.</p> <p>If process knowledge or the maximum sample concentration for contaminated materials indicates that the materials are not to be designated as listed, characteristic, toxic, persistent, PCB, or asbestos-containing material, then materials will be evaluated for being sent to a solid waste landfill in accordance with DR #9.</p>
9	<p>If process knowledge or the maximum sample concentration dictate land disposal restriction-imposed treatment, then the materials will be treated and disposed of at the ERDF or stored at the CWC pending future treatment and final disposal.</p> <p>If process knowledge or the maximum sample concentration does not dictate land disposal restriction-imposed treatment of the materials, then the materials will be disposed of at the ERDF.</p>
10	<p>If process knowledge or the maximum sample concentration for materials indicates that the materials are likely to be reused or recycled, then the materials will be further surveyed against site release criteria.</p> <p>If process knowledge or the maximum sample concentration for materials indicates that the materials are not likely to be reused or recycled, then the materials will be disposed of in accordance with DR #1 through DR #9.</p>

Table 1-3. Decision Rules. (2 Pages)

DR #	Decision Rules
11	<p>If the maximum sample concentration for soil in the bottom of the excavation indicates that the soil remaining exceeds the action levels in Table 2-1, then further excavation will be performed; or further analysis of potential risk to human health and the environment will be analyzed, and a remedy for the 200-W-42 VCP in association with the 200-UW-1 OU will be evaluated by the Tri-Parties.</p> <p>If the maximum sample concentration for soil in the bottom of the excavation indicates that the soil remaining does not exceed the action levels in Table 2-1, then the results will be documented and no further remedial action will be required.</p>

*DR #2 through DR #8 support waste designation.

CWC = Central Waste Complex.
 DR = decision rule.
 ERDF = Environmental Restoration Disposal Facility.
 PCB = polychlorinated biphenyl.

1.6 GENERAL SAMPLE DESIGN CONCEPTS

The nature of the 200-UW-1 OU waste sites supports the use of focused sampling, as identified in Ecology 94-49, *Guidance on Sampling and Data Analysis Methods*. This guidance document defines "focused sampling" as selective sampling of areas where potential or suspected soil contamination can reliably be expected to be found if a release of a hazardous substance has occurred.

These waste sites have attributes such as visible surface debris, known discharge release points in engineered structures such as cribs or french drains, or subsurface debris that can be identified by surface geophysics techniques, or have a primary constituent which has a gamma/and or beta emitter that can be identified by surface/near surface radiological surveys. Therefore, sampling in a focused manner will ensure data collection of the area of greatest impact associated with the release. Additional efforts may be needed to determine the worst-case location for the sample(s) collection within these sites, such as driven soil probes and gamma logging, which will provide additional data on gamma-emitting radionuclides to support the focused sampling regime.

Sampling locations would be selected during site walk downs by prime contractor technical staff familiar with the 200-UW-1 OU and the waste sites in question. The primary judgment used in selecting sample locations/materials is field-screening results (e.g., detectable radioactive contamination as defined with field instruments) or suspicious locations/materials based on visual inspection (e.g., stained soil areas or debris known to represent hazardous/dangerous/radioactive waste in the past). The Tri-Parties (U.S. Department of Energy [DOE], U.S. Environmental Protection Agency [EPA], and Ecology) agency personnel typically participate in the walk downs and are asked to concur with the sample locations/materials selected.

1.6.1 Focused Sampling

Focused sampling designs are appropriate for waste characterization to ensure compliance with the receiving facilities' waste acceptance criteria. Statistical sampling designs will not be implemented for this portion of the sampling effort. Samples will be collected from site locations where existing analytical data, process knowledge, and field radiological surveys indicate maximum contamination, or "worst case," concentrations are expected to establish the maximum concentrations of the contamination. The number of samples, the depth of sampling, the types of samples, and their locations would be developed judgmentally based on site knowledge. Details of the focused sampling design are presented in Chapter 3.0.

1.6.2 Statistical Sampling

A statistical sampling design will be used for characterization of the waste generated from removal of the concrete pad, because this site has no identifiable release point. Therefore, the pad will be sampled using a systematic grid (the concrete pad will be divided into 1 by 1 m [3- by 3-ft] sections) approach to determine the distribution of the contamination. Historical data, professional judgment, and/or field-screening data would be used to identify likely contaminated areas for placement of a sampling grid.

Likewise, if no radiological contamination can be detected in the 200-W-42 VCP excavation, then a focused sampling design will not be appropriate. In this event, a statistical sampling design will be used to ensure that the removal action objectives are met for the site.

1.6.3 Radiological Field Screening

For the sampling effort, field screening will be used to establish site radiological contamination levels. In addition, field screening for radiological contamination (Cs-137) may be used as a "tracer" to locate areas of chemical contamination. If field-screening results indicate the presence of radiological contamination, the areas can be further characterized with laboratory analytical samples. Further details regarding field screening are presented in Chapter 3.0.

1.7 WASTE DISPOSITION OPTIONS

Project activities will result in generation of waste. The majority of the contaminated media likely will be designated as low-level waste; however, quantities of mixed waste, dangerous waste, and solid waste not contaminated with hazardous substances may be generated.

Waste generated will be disposed of at an appropriate disposal site, most likely the ERDF. Recycling and/or reuse options will be evaluated and implemented where possible to reduce the volume of material disposed.

Contaminated waste for which no reuse, recycle, or decontamination option is identified would be assigned an appropriate waste designation (e.g., solid, asbestos, polychlorinated biphenyl, radioactive, dangerous, or mixed) and disposed of at an approved disposal location. For the

purposes of this project, most of the contaminated waste generated during implementation of this project is assumed to be disposed of onsite at the ERDF. Alternate potential disposal locations may be considered during the project if a suitable and cost-effective location is identified. Alternate potential disposal locations will be evaluated using appropriate performance standards to ensure that they are adequately protective of human health and the environment.

The ERDF is considered to be onsite for management and/or disposal of waste from this project. There is no requirement to obtain a permit to manage or dispose of CERCLA waste at the ERDF. It is expected that the great majority of the waste generated during the project can be disposed of onsite at the ERDF. For waste that must be sent offsite, including the Central Waste Complex, The EPA must make a determination in accordance with 40 CFR 300.440, "National Oil and Hazardous Substances Pollution Contingency Plan," "Procedures for Planning and Implementing Off-Site Response Actions," regarding acceptability of the proposed disposal site for receiving this CERCLA removal action waste. Because the Central Waste Complex is considered offsite for the management of CERCLA waste from this project, an offsite determination must be made by the EPA before shipment of project waste to the Central Waste Complex.

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2.0 QUALITY ASSURANCE PROJECT PLAN

This section of the SAP, the quality assurance project plan (QAPjP), establishes the quality requirements for environmental data collection, including sampling, field measurements, and laboratory analysis. The QAPjP, in concert with the other SAP chapters, complies with the requirements of EPA/240/B-01/003, *EPA Requirements for Quality Assurance Project Plans*, EPA QA/R-5.

DOE/RL-98-28, *200 Areas Remedial Investigation/Feasibility Study Implementation Plan – Environmental Restoration Program*, provides the general framework of technical and administrative requirements that apply to sites within OUs in the 200 Areas.

To meet the site-specific needs for the 200-UW-1 OU Support Activities project, this QAPjP identifies supplemental requirements developed during the DQO process. These requirements are listed as follows.

- **Analytical Performance.** Requirements for detection limits, precision, and accuracy are presented in Section 2.2.3, Table 2-1. The analytical methods also are shown.
- **Field Quality Control (QC).** The frequency and type of QC samples to be collected are addressed in Section 2.2.4.
- **Onsite Measurements QC.** The specific types of QC samples for onsite measurements and the frequency of collection are addressed in Section 2.2.7.
- **Data Validation and Usability.** Specific validation requirements, including the frequency and level of validation, are addressed in Section 2.4.

The following sections describe the site quality requirements and the procedural controls applicable to this action.

2.1 PROJECT MANAGEMENT

The following subsections address the basic areas of project management and will ensure that the 200-UW-1 OU Support Activities project has a defined goal, the participants understand the goal and the approach to be used, and the planned outputs have been appropriately documented.

2.1.1 Project/Task Organization

The prime contractor to RL or its approved subcontractors will be responsible for collecting, packaging, and shipping soil/debris samples to the laboratory. Detailed responsibilities of those involved in all aspects of the sampling and analysis, from sample collection to disposition, including data generation and acquisition, assessment and oversight, and data validation and usability, are described in D&D-24718, *U Plant Closure Area: Waste Site Remediation Project, Specific Project Execution Plan*.

2.1.2 Quality Objectives and Criteria for Measurement Data

The detection limits and precision and accuracy requirements for each analysis to be performed are summarized in Section 2.2.3, Table 2-1.

2.1.3 Special Training Requirements and Certification

Training and certification requirements are established in D&D-24718. These requirements provide the training and qualification programs for the 200-UW-1 OU Support Activities project personnel who operate, support, or supervise 200-UW-1 OU Support Activities project activities. In addition, these requirements satisfy multiple training drivers imposed by DE-AC06-96RL13200, *Project Hanford Management Prime Contract* (including applicable CFRs, DOE Orders, American National Standards Institute/American Society of Mechanical Engineers Standards, and *Washington Administrative Code* requirements). The 200-UW-1 OU Support Activities project site-specific health and safety plan, work packages, permits, and job hazards analysis forms will provide additional training requirements.

Field personnel typically will have completed the following training before starting work:

- Occupational Safety and Health Administration 40-hour Hazardous Waste Worker Training
- 8-hour hazardous waste worker refresher training (as required)
- Radiation Worker II Training
- Hanford General Employee Training.

Field personnel training records will be documented and kept on file by the training organization.

2.1.4 Documentation and Records

Documentation and records, regardless of media or format, are controlled in accordance with D&D-24718. The documentation and records consist of a collection of document control systems and processes that use a graded approach for the preparation, review, approval, distribution, use, revision, storage/retention, retrieval, disposition, and protection of documents and records generated or received in support of prime contractor work.

2.2 DATA/MEASUREMENT ACQUISITION

The following subsections present the requirements for sampling methods, sample handling and custody, analytical methods, and field and laboratory QC. Instrument calibration, maintenance supply inspections, and data management requirements also are addressed.

2.2.1 Sampling Identification

The *Sample Data Tracking System* database may be used to track the samples from the point of collection through the laboratory analysis process when the results will be used for future remedial activities. The *Hanford Environmental Information System* (HEIS) database is the repository for laboratory analytical results. The HEIS sample numbers will be issued to the sampling organization for the 200-UW-1 OU Support Activities project. For sample results used to manage matrices destined for the ERDF, HEIS will not be used.

2.2.2 Sample Handling, Shipping, and Custody Requirements

Samples are collected, labeled, packaged, shipped, stored, and dispositioned in accordance with approved project and analytical laboratory technical work requirements and processes, and/or work packages that ensure samples are collected, transferred, stored, and analyzed by authorized personnel; that sample integrity is maintained from collection through disposition; and that an accurate record of handling and custody is maintained from collection through disposition.

An unbroken chain of custody is established and documented using SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update III-A*. All field sampling activities are documented in controlled field logbooks in accordance with SW-846 and processes that, as a minimum, record the names of those collecting samples, the date and time samples are collected, the locations samples are collected, the sample identification numbers, the sample container type and size, and the description of the sample media.

2.2.3 Analytical Methods Requirements

Analytical parameters and methods are listed in Table 2-1.

Table 2-1. Analytical Performance Requirements. (3 Pages)

Data Type	Analyte	Analytical Method	Action Level ^{a, b, f}	Detection Limit Requirements ^c	Accuracy Req't (% Recovery)	Precision Req't (%RPD)
Performance Requirements for Laboratory Measurements (Radiological)						
Rad	Am-241	AmAEA	335 pCi/g	1 pCi/g	70-130 ^d	±30 ^d
Rad	Cs-134	GEA	8.43 pCi/g	0.1 pCi/g	70-130 ^d	±30 ^d
Rad	Cs-137	GEA	23.4 pCi/g	0.1 pCi/g	70-130 ^d	±30 ^d
Rad	Eu-152	GEA	11.4 pCi/g	0.1 pCi/g	70-130 ^d	±30 ^d
Rad	Eu-154	GEA	10.3 pCi/g	0.1 pCi/g	70-130 ^d	±30 ^d
Rad	Np-237	NpAEA	59.2 pCi/g	1 pCi/g	70-130 ^d	±30 ^d
Rad	Pu-238	PuAEA	470 pCi/g	1 pCi/g	70-130 ^d	±30 ^d
Rad	Pu-239/240	PuAEA	425 pCi/g	1 pCi/g	70-130 ^d	±30 ^d
Rad	Ra-226	GEA	7.03 pCi/g	0.1 pCi/g	70-130 ^d	±30 ^d

Table 2-1. Analytical Performance Requirements. (3 Pages)

Data Type	Analyte	Analytical Method	Action Level ^{a, b, f}	Detection Limit Requirements ^c	Accuracy Req't (% Recovery)	Precision Req't (%RPD)
Rad	Ra-228	GEA	8.15 pCi/g	0.2 pCi/g	70-130 ^d	±30 ^d
Rad	Se-79	ICP-MS	No limit established	0.1 pCi/g	70-130 ^d	±30 ^d
Rad	Sr-90	Sr-Gas Proportional Counter	22.5 pCi/g	1 pCi/g	70-130 ^d	±30 ^d
Rad	Tc-99	Chemical separation/liquid scintillation	1 pCi/g	1 pCi/g	70-130 ^d	±30 ^d
Rad	Th-232	ICP-MS	4.8 pCi/g	1 pCi/g	70-130 ^d	±30 ^d
Rad	U-233/234	UAEA	2,665 pCi/g	1 pCi/g	70-130 ^d	±30 ^d
Rad	U-235	UAEA	101 pCi/g	1 pCi/g	70-130 ^d	±30 ^d
Rad	U-238	UAEA	504 pCi/g	1 pCi/g	70-130 ^d	±30 ^d
Performance Requirements for Field Measurements (Radiological)						
Rad	Gross alpha	Portable contamination detector	N/A (indication only)	100 d/min/ 100 cm ²	N/A	N/A
Rad	Gross beta/gamma	Portable contamination detector	N/A (indication only)	5,000 d/min/ 100 cm ²	N/A	N/A
Performance Requirements for Laboratory Measurements (Nonradiological)						
Chem	Ag	EPA 1311/6010/200.8	13.6 mg/kg	0.2 mg/kg	70-130 ^e	±30 ^e
Chem	As	EPA 1311/6010/200.8	6.47 mg/kg	2.2 mg/kg	70-130 ^e	±30 ^e
Chem	Cr	EPA 1311/6010/200.8	67 mg/kg	1 mg/kg	70-130 ^e	±30 ^e
Chem	Hg	EPA 1311/6010/200.8	2.09 mg/kg	0.2 mg/kg	70-130 ^e	±30 ^e
Chem	Sb	EPA 1311/6010/200.8	5.4 mg/kg	0.6 mg/kg	70-130 ^e	±30 ^e
Chem	Se	EPA 1311/6010/200.8	1 mg/kg	1 mg/kg	70-130 ^e	±30 ^e
Chem	Tl	EPA 1311/6010/200.8	1.59 mg/kg	0.5 mg/kg	70-130 ^e	±30 ^e
Chem	Ti	EPA 1311/6010/200.8	Unlimited	1 mg/kg	70-130 ^e	±30 ^e
Chem	Uranium (metal)	EPA 1311/6010/200.8	3.21 mg/kg	1 mg/kg	70-130 ^e	±30 ^e
Chem	Nitrogen as nitrite	EPA 300.0	40 mg/kg	0.5 mg/kg	70-130 ^e	±30 ^e

Table 2-1. Analytical Performance Requirements. (3 Pages)

Data Type	Analyte	Analytical Method	Action Level ^{a, b, f}	Detection Limit Requirements ^c	Accuracy Req't (% Recovery)	Precision Req't (%RPD)
Chem	Nitrogen as nitrate	EPA 300.0	40 mg/kg	0.9 mg/kg	70-130 ^e	±30 ^e
Chem	Bis (2-ethylhexyl) phthalate	EPA 8270 ^a	13.9 mg/kg	0.33 mg/kg	70-130 ^e	±30 ^e
Chem	Di-n-butyl phthalate	EPA 8270 ^a	56.5 mg/kg	0.66 mg/kg	70-130 ^e	±30 ^e
Chem	Pentachlorophenol	EPA 8270	0.33 mg/kg	0.33 mg/kg	62-114 ^e	±30 ^e
Chem	Kerosene	NWTPH-D	2,000 mg/kg	8 mg/kg	70-130 ^e	±30 ^e
Chem	Acetone	EPA 8260 ^b	28.9 mg/kg	0.02 mg/kg	70-130 ^e	±30 ^e
Chem	Bromomethane	EPA 8260 ^b	0.01 mg/kg	0.01 mg/kg	70-130 ^e	±30 ^e
Chem	Chloromethane	EPA 8260 ^b	0.0165 mg/kg	0.01 mg/kg	70-130 ^e	±30 ^e
Chem	Methylene chloride	EPA 8260 ^b	0.0218 mg/kg	0.005 mg/kg	70-130 ^e	±30 ^e
Chem	Toluene	EPA 8260 ^b	7.27 mg/kg	0.005 mg/kg	70-130 ^e	±30 ^e
Chem	Chloride	EPA 300.0	1,000 mg/kg	2 mg/kg	70-130 ^e	±30 ^e
Chem	Sulfate	EPA 300.0	1,000 mg/kg	7 mg/kg	70-130 ^e	±30 ^e
Chem	Fluoride	EPA 300.0	5.78 mg/kg	0.5 mg/kg	70-130 ^e	±30 ^e
Chem	Asbestos	PLM	1 wt%	<1 wt %	N/A	N/A

Table 2-1. Analytical Performance Requirements. (3 Pages)

Data Type	Analyte	Analytical Method	Action Level ^{a, b, f}	Detection Limit Requirements ^c	Accuracy Req't (% Recovery)	Precision Req't (%RPD)
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^aListed values represent the most restrictive soil preliminary remediation goal. This process takes the most conservative value derived from evaluation of direct contact, groundwater, and terrestrial wildlife protection and evaluates this value to ensure that it is not less than natural background and analytical considerations, as indicated in WAC 173-340-700(6)(d). Values represented are for screening purposes. Site-specific evaluation and modeling will be performed to determine if remedial actions are protective of human health and the environment.

^bListed values represent soil preliminary remediation goals and will be used to determine if remedial action goals have been obtained for this removal, treatment, and disposal site. For waste disposal purposes, the action levels that apply to each of the COPCs and COCs are the *Resource Conservation and Recovery Act of 1976* waste designation levels (WAC 173-303) and BHI-000139. Analytical data for the COPCs and COCs will be used to designate the waste streams and develop waste profiles.

^cDetection limit requirements are taken from DOE/RL-2003-23.

^dAccuracy criteria for associated batch laboratory control sample percent recoveries. With the exception of GEA, additional analysis-specific evaluations also are performed for matrix spikes, tracers, and carriers as appropriate to the method. Precision criteria for batch laboratory replicate sample analyses. Precision criteria for batch laboratory sample replicate and matrix spike replicate determinations are only applicable when results are greater than 5 to 10 times the method detection limit.

^eAccuracy criteria for associated batch matrix spike percent recoveries. Evaluation based on statistical control of laboratory control samples also is performed. Precision criteria for batch laboratory replicate matrix spike analyses or replicate sample analyses. Compounds spiked in the laboratory control sample or matrix spike are those specified in SW-846. Criteria based on laboratory statistical control limits are acceptable. Precision criteria for batch laboratory sample replicate and matrix spike replicate determinations are only applicable when results are greater than 5 to 10 times the method detection limit.

^fThe "Action Level" for the metals is based on total acid soluble metals, not TCLP by EPA 1311.

^gThere is no recovery data on Semi VOA (EPA 8270) analytes Di-n-butyl phthalate or Bis (2-ethylhexyl) phthalate since they are never spiked for Laboratory Control Sample (LCS) or Matrix Spike (MS). The list of compounds analyzed for QC purposes are those recommended in EPA SW-846.

^hFor VOA (EPA 8260), the only listed compound in Table 2-1 that has QC specifically associated with it is Toluene. The other listed compounds do not have specific "Accuracy" limits calculated for them. The list of compounds analyzed for QC purposes are those recommended in EPA SW-846.

BHI-00139, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*.

DOE/RL-2003-23, *Focused Feasibility Study for the 200-UW-1 Operable Unit*.

Four-digit EPA methods are found in SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update III-A*. For EPA Method 200.8, see EPA/600/R-94/111, *Methods for the Determination of Metals in Environmental Samples, Supplement 1*. For EPA Method 300.0, see EPA/600/4-79/020, *Methods of Chemical Analysis of Water and Wastes*.

WAC 173-303, "Dangerous Waste Regulations."

WAC 173-340-700(6)(d), "Overview of Cleanup Standards," "Requirements for Setting Cleanup Levels," "Natural Background and Analytical Considerations."

AEA = alpha energy analysis.

COC = contaminant of concern.

COPC = contaminant of potential concern.

d/min = disintegrations per minute.

EPA = U.S. Environmental Protection Agency.

GEA = gamma energy analysis.

N/A = not applicable.

NWTPH-D = Northwest total petroleum hydrocarbon - diesel.

PLM = polarized light microscopy.

RPD = relative percent difference.

WAC = Washington Administrative Code.

2.2.4 Quality Control Requirements

QC must be provided in the field and laboratory to ensure that reliable data are obtained. When performing this field sampling effort, care shall be taken to prevent the cross-contamination of sampling equipment, sample bottles, and other equipment that could compromise sample integrity. Deviations shall be controlled and documented in accordance with requirements for managing field logbooks.

Analytical laboratories implement the QC requirements specified in their quality assurance plans. QC of radiological surveys is implemented in accordance with minimum requirements established by 10 CFR 835, "Occupational Radiation Protection," and provide the basis for consistent and uniform implementation of radiological control requirements.

Table 3-1 lists the field QC requirements for sampling. Disposable (i.e., single-use) equipment will be used; therefore, equipment rinsate blanks are not required. If volatile organic compound samples are not collected, field trip blanks are not required. The collection of QC samples for onsite measurements is not applicable to field-screening techniques described in this plan.

Field Duplicates. Field duplicates provide information regarding the homogeneity of the sample matrix and may provide an evaluation of the precision of the analysis process. Field duplicates will be retrieved from sample intervals using the same equipment and sampling technique. The duplicates should be collected from areas expected to be contaminated, so that valid comparisons between the samples can be made (i.e., at least some of the COPCs and COCs will be above the detection limit). Field duplicates for soil are collected and homogenized before being divided into two samples in the field. If volatile organic analyte samples are required, they should be collected before homogenization. The duplicate samples will be sent to the primary laboratory in the same manner that the routine site samples are sent.

Equipment Rinsate Blanks. Equipment rinsate blanks are used to verify the adequacy of sampling equipment decontamination procedures. Equipment blanks will consist of deionized water washed through decontaminated sampling equipment, placed in containers, and analyzed for the COPCs and COCs identified.

Prevention of Cross-Contamination. Care will be exercised to avoid the following ways in which cross-contamination or background contamination may compromise the samples: (1) improperly storing or transporting sampling equipment and containers; (2) contaminating equipment or sample bottles by exposing them to contamination sources, such as uncovered ground; (3) handling bottles or equipment with dirty hands; or (4) improperly decontaminating equipment before or between sampling events.

2.2.5 Instrument Testing, Inspection, and Maintenance Requirements

All onsite environmental instruments and measuring equipment are tested, inspected, and maintained in accordance with the manufacturers' requirements and in accordance with approved work packages. The results of tests, inspections, and maintenance activities are documented in logbooks and/or work packages.

Analytical laboratory instruments and measuring equipment are tested, inspected, and maintained in accordance with the laboratories' quality assurance plan. Daily response checks for radiological field survey instruments are performed in accordance with approved work packages.

2.2.6 Instrument Calibration and Frequency

Analytical laboratory instruments and measuring equipment are calibrated in accordance with the laboratories' quality assurance plan. Calibration of radiological field survey instruments on the Hanford Site is performed under contract by Pacific Northwest National Laboratory (PNNL) or by the prime contractor on an annual basis, as specified in the program documentation. The results of calibrations are documented in logbooks and/or work packages.

2.2.7 Onsite Measurements Quality Control

No QC samples in support of onsite measurements will be required. QC samples will be collected in accordance with Table 3-1.

2.2.8 Inspection/Acceptance Requirements for Supplies and Consumables

Supplies and consumables procured by the prime contractor, which are used in support of sampling and analysis activities, are procured in accordance with internal work requirements and processes that describe the prime contractor acquisition system and the responsibilities and interfaces necessary to ensure structures, systems, and components, or other items and services procured/acquired for the prime contractor, meet the specified technical and quality requirements. The procurement process ensures that purchased items and services comply with applicable procurement specifications. Supplies and consumables are checked and accepted by users before use.

Supplies and consumables procured by the analytical laboratories are procured, checked, and used in accordance with their quality assurance plan.

2.2.9 Sample Preservation, Containers, and Holding Times

Sample preservation, container, and holding time requirements will be guided by SW-846.

2.3 ASSESSMENT/OVERSIGHT

2.3.1 Assessments and Response Action

The prime contractor compliance and quality programs group may conduct random surveillance and assessments to verify compliance with the requirements of this SAP, project work packages, the project quality management plan, procedures, and regulatory requirements.

Deficiencies identified will be reported to the 200 Areas task lead. When appropriate, corrective actions will be taken by the project engineer in accordance with internal work processes and procedures to minimize recurrence.

Surveillances and assessments are performed by qualified personnel in accordance with approved prime contractor processes and procedures. Deficiencies are documented, reported, investigated, corrected, tracked, and verified in accordance with approved prime contractor processes and procedures.

2.3.2 Reports to Management

Management will be made aware of all deficiencies identified by self-assessments. Identified deficiencies will be reported to the on-scene coordinator.

2.4 DATA VERIFICATION, USABILITY, VALIDATION, MANAGEMENT, AND REVIEW

2.4.1 Data Verification and Usability Methods

Data review and verification will be performed by the laboratory to confirm that the sampling and chain-of-custody documents are complete, the sample number is tied to the sampling location, the required holding times were met, and the analyses met the data quality requirements specified in this SAP.

All data verification and usability assessments will be performed in accordance with approved work processes and requirements.

2.4.2 Data Validation

Validation will be performed on completed laboratory data packages by qualified personnel or by a qualified independent contractor. Validation will consist of verifying required deliverables, requested versus reported analyses, and transcription errors. Validation also will include the evaluation and qualification of results based on holding time, method blanks, matrix spikes, laboratory control samples, laboratory duplicates, and chemical and tracer recoveries, as appropriate to the methods used. No other validation or calculation checks will be performed. At least 5 percent of all data will be validated.

Data verification and validation shall be performed in accordance with EPA/240/R-02/004, *Guidance on Environmental Data Verification and Data Validation*. A validation performed in a comparable manner to Level C will be performed on onsite laboratory analyses. This allows the review of all QC data, transcription error verification, and holding time review. This level is the middle validation level and does not require review of raw data and recalculation of data. Should problems arise from the Level C review, the project reserves the option to review or recalculate.

2.4.3 Data Management and Review

Data resulting from the implementation of the SAP will be managed and stored by the organization in accordance with document control and record management systems that define requirements for managing the generation, identification, transfer, protection, storage, retention, retrieval, and disposition of DOE records.

All validated reports and supporting analytical data packages shall be subject to final technical review by qualified reviewers before submittal to regulatory agencies or inclusion in reports or technical memoranda, at the direction of the 200-UW-1 OU Support Activities project task lead. Electronic data access, when appropriate, shall be through computerized databases. Where electronic data are not available, hard copies will be provided in accordance with Section 9.6 of the *Hanford Federal Facility Agreement and Consent Order Action Plan* (Ecology et al. 1989).

All validated reports and supporting analytical data packages will be retained and dispositioned in accordance with established document control and record management systems.

2.4.4 Data Quality Assessment

The data quality assessment process is used to determine if the data are adequate to support the remedial action decisions established in the DQO process. The data quality will be assessed in accordance with EPA/240/R-02/004.

2.5 TECHNICAL PROCESSES AND SPECIFICATIONS

Soil sampling and field measurements will be conducted according to the following approved work processes.

Sample Identification. The *Sample Data Tracking System* database will be used to track the samples through the collection and laboratory analysis process. The HEIS database is the repository for the laboratory analytical results. HEIS sample numbers will be issued to the sampling organization. Each sample will be identified and labeled with a unique HEIS sample number. The sample location, depth, and corresponding HEIS numbers will be documented in the sampler's field logbook.

Each sample container will be labeled with the following information, using a waterproof marker on firmly affixed, water-resistant labels:

- HEIS number
- Sample collection date/time
- Name/initials of person collecting the sample
- Analysis required
- Preservation method, if applicable.

Field Sampling Log. All information pertinent to field sampling and analysis will be recorded in bound logbooks in accordance with SW-846. The sampling team will be responsible for recording all relevant sampling information. Entries made in the logbook will be dated and signed by the individual who made the entry.

Sample Custody. A chain-of-custody record will be initiated at the time of sampling and will accompany each set of samples shipped to the laboratory. The analyses requested for each sample will be indicated on the accompanying Chain-of-Custody/Sample Analysis Request form. Chain-of-custody procedures will be followed throughout sample collection, transfer, analysis, and disposal to ensure that sample integrity is maintained. Each time responsibility for custody of the sample changes, the new and previous custodians will sign the record and note the date and time. The sampler will make a copy of the signed record before the sample is shipped and will transmit it to Environmental Information System (EIS) Sample and Data Management within 24 hours of shipping.

A custody seal (i.e., evidence tape) will be affixed to the lid of each sample jar in a manner that would indicate tampering. The container seal will be inscribed with the sampler's initials and the date sealed.

Sample Containers and Preservatives. Level I EPA precleaned sample containers will be used for soil samples. Container sizes may vary, depending on laboratory-specific volumes needed to meet analytical detection limits. If, however, the dose rate on the outside of a sample jar, or the curie content, exceeds levels acceptable by an offsite laboratory, the sampling lead and task lead can send smaller volumes to the laboratory after consultation with EIS Sample and Data Management to determine acceptable volumes. Final container types and volumes will be provided by the Waste Sampling and Characterization Facility (WSCF) Sampling and Mobile Laboratory organization.

Sample Shipping. A radiological control technician will survey each sample jar to verify that the container is free of smearable surface contamination. The radiological control technician also will measure the radiological activity on the outside of the sample container (through the container) and will mark the container with the highest contact radiological reading in either disintegrations per minute or millirem per hour, as applicable. Total activity analysis performed by the Radiological Counting Facility, the 222-S Laboratory, or another suitable onsite laboratory will be used for determining U.S. Department of Transportation shipping criteria. This information, along with other data that may prequalify the samples, will be used to select proper packaging, marking, labeling, and shipping paperwork in accordance with U.S. Department of Transportation regulations (49 CFR, "Transportation") and to verify that the sample can be received by the offsite analytical laboratory. The sampler will send copies of the shipping documentation to EIS Sample and Data Management within 24 hours of shipping.

As a general rule, samples will be sent to the WSCF Sampling and Mobile Laboratory. Samples with activities less than 1 mR/h may be shipped to an offsite laboratory. Samples with activities between 1 and 10 mR/h also may be shipped to an offsite laboratory, but must first be evaluated by EIS Sample and Data Management. Samples with activities greater than 10 mR/h will be sent to an onsite laboratory arranged by EIS Sample and Data Management.

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3.0 FIELD SAMPLING PLAN

3.1 SAMPLING OBJECTIVES

The primary objective of the field sampling plan is to clearly identify and describe the sampling and analysis activities that will be conducted to support the 200-UW-1 OU Support Activities project decisions. The field sampling plan uses the sampling approaches developed in the DQO process (CP-26827) and subsequent workshops with RL, EPA, and Ecology as the basis for the site-specific sampling plan presented in the following sections. The overall sampling strategy is outlined in Table 3-1. Changes to the field sampling plan may be made in the field by the designated on-scene coordinator. The on-scene coordinator is identified in 05-AMCP-0428, "U.S. Department of Energy (DOE) Designation of Remedial Project Managers (RPMs) and On-Scene Coordinators (OSCs) for Removal and Remedial Actions Conducted Under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) at the Hanford Site."

3.1.1 Field Measurements

Surface Radiation Survey. A surface radiation survey will be performed at the areas to be removed as part of this project (soil, clay pipe, crib vent risers, and TEDF pipeline), to document existing surface contamination and to support preparation of supporting health and safety documentation. Surface radiation surveys will be conducted by qualified radiological control technicians. A survey report will be prepared documenting the results of each survey. Post-sampling surveys also will be performed at each sampling site to ensure that sampling activities have not contributed to surface contamination.

Radiological Screening. For the sampling effort in the 200-W-42 VCP and associated excavation, field screening will be used to establish site radiological contamination levels. In addition, field screening for radiological contamination will be used as a tracer to locate areas of chemical contamination, because process knowledge shows that all of the discharges to the 200-W-42 VCP and associated cribs contained both radiological and chemical constituents. If field-screening results indicate the presence of Cs-137, the areas with the highest levels of contamination will be further characterized with analytical samples to bound the contaminants.

A similar strategy will be used for the crib vent risers. Radiological smear samples and field instruments will be used to determine if radiological contamination (Cs-137) is present. If present, laboratory analyses will be performed to determine radiological concentrations present in the risers.

The portion of TEDF pipeline to be removed and disposed of is not expected to be contaminated with radiological or chemical contaminants, based on process knowledge, effluent sample data, and administrative controls imposed by TEDF to eliminate regulated discharges to the system. Therefore, only a confirmatory field radiological smear from the interior of the pipeline is anticipated to be required to confirm process knowledge.

Table 3-1. 200-UW-1 Operable Unit Support Activities Sampling Plan. (3 Pages)

Waste Stream	Data Needs	Recommended Sampling Approach	Location and Number of Samples	COPCs and COCs
Vitrified clay pipe.	Radiological and chemical data for characterization for waste disposal.	<ul style="list-style-type: none"> • Perform visual inspection of pipeline conditions during excavation; document condition. • Perform field radiological survey of excavated pipeline; document results. • Using Cs-137 as a tracer, collect one biased sample of clay pipe at highest radiological survey reading and split between two containers for laboratory analysis; also collect one trip blank. • Perform full suite of WSCF laboratory analyses for radiological and chemical constituents listed in Table 1-2. • Photographic documentation of the sampling activities may be used for documentation purposes. • A portion of clay pipe may be archived for use in future remedial action decision making. • A radiological survey report will be prepared to document the field information gathered. 	Collect one biased pipe sample at highest field radiological survey reading (split sample into two samples) plus one trip blank for laboratory analysis.	All radiological and chemical constituents listed in Table 1-2.

Table 3-1. 200-UW-1 Operable Unit Support Activities Sampling Plan. (3 Pages)

Waste Stream	Data Needs	Recommended Sampling Approach	Location and Number of Samples	COPCs and COCs
<p>200-W-42 VCP Excavations.</p> <p><i>NOTE: There will be two excavation areas, which will be sampled as individual decision units. The lengthwise walls of each trench also will be sampled. Each set of two walls will be considered one decision unit.</i></p>	<p>Radiological and chemical data for characterization for waste disposal.</p>	<ul style="list-style-type: none"> • Perform visual inspection of soil conditions and any visible releases under the VCP line; document conditions. • Perform field radiological survey of excavated trenches, using Cs-137 as a tracer; document results. • If minimal areas of detectable contamination are located, flags will be placed at areas with readings for use in sample collection. • If radiological contamination is widespread, the trench will be sectioned into 1 m (3-ft) grids, with a reading taken at each grid and documented. • Collect a minimum of 5 to 12 biased samples from areas of highest radiological contamination; also collect 1 field duplicate and 1 trip blank for each day of sampling. If no radiological contamination is detected in the field, then a minimum of 5 to 12 random samples will be collected. • Perform full suite of WSCF laboratory analyses for radiological and chemical constituents listed in Table 1-2. • Photographs of the sampling activities should be used for documentation purposes whenever possible. • A detailed grid system and an accompanying global positioning system (GPS) sample site location, or a grid system that has a permanent above-ground reference point will be used to document the location of sample points in the excavations. • A radiological survey report will be prepared to document the field information gathered. 	<p>Collect a minimum of 5 to 12 biased soil samples at the highest field radiological survey reading from the bottom of each trench and from the lengthwise walls of each trench, plus 1 trip blank and 1 field duplicate for laboratory analyses for each day of sampling. If no radiological contamination is detected, random samples will be collected in lieu of biased samples.</p> <p>In the event that radiological contamination is concentrated in one area in the excavation, an additional soil sample will be collected from an area where no detectable contamination was found, for verification purposes.</p>	<p>All radiological and chemical constituents listed in Table 1-2.</p>

Table 3-1. 200-UW-1 Operable Unit Support Activities Sampling Plan. (3 Pages)

Waste Stream	Data Needs	Recommended Sampling Approach	Location and Number of Samples	COPCs and COCs
216-U-8 and 216-U-12 Crib vent risers.	Radiological data for characterization for waste disposal.	<ul style="list-style-type: none"> Collect radiological smear samples from the inside of each crib vent riser and take readings using Cs-137 as a tracer; document results. Highest detected smear sample will be sent to the WSCF laboratory for radiological analyses only. If no detectable radiological contamination can be identified using field instruments for direct readings on the risers and smear samples, then no further analyses will be conducted. Photographs of the sampling activities should be used for documentation purposes whenever possible. A radiological survey report will be prepared to document the field information gathered. 	Collect a radiological smear sample from inside of each of the three risers. The smear sample with the highest reading will be taken to the laboratory for analyses, along with one field blank.	Radiological constituents listed in Table 1-2.
Concrete pad near the 216-U-8 and 216-U-12 Crib.	Radiological and chemical data for characterization for waste disposal.	<ul style="list-style-type: none"> Perform visual inspection of the concrete slab and document any visible signs of spills. Grid the concrete pad and collect a minimum of 5 to 12 random concrete samples for laboratory analyses; also collect 1 field duplicate and 1 trip blank. Photographs of the sampling activities should be used for documentation purposes whenever possible. A radiological survey report will be prepared to document the field information gathered. 	Collect a minimum of 5 to 12 random concrete samples from the pad plus 1 trip blank and 1 field duplicate for laboratory analyses.	All radiological and chemical constituents listed in Table 1-2.
TEDF pipeline.	Radiological data to confirm process knowledge.	<ul style="list-style-type: none"> Collect radiological smear sample from inside of piping and survey using field instruments. If no detectable radiological contamination can be identified using field instruments for direct readings on the pipeline and smear sample, then no further analyses will be conducted. Photographs of the sampling activities should be used for documentation purposes whenever possible. A radiological survey report will be prepared to document the field information gathered. 	Collect one radiological smear sample from inside of pipe. The smear sample will be taken to the laboratory for analyses, along with one field blank.	Radiological constituents listed in Table 1-2. Sampling only to confirm process knowledge of pipeline.

COC = contaminant of concern.
 COPC = contaminant of potential concern.
 TEDF = Treated Effluent Disposal Facility.

VCP = vitrified clay pipe.
 WSCF = Waste Sampling and Characterization Facility.

Before sampling begins, a local background activity reading will be taken at a location selected in the field. Field screening will be used to identify detectable radiological contamination, adjust sampling points if needed, assist in determining sample shipping requirements, determine equipment/personnel decontamination needs, and support worker health and safety monitoring.

Field-screening instruments will be used, maintained, and calibrated in accordance with the instrument program, manufacturers' specifications, and other approved procedures.

3.1.2 Media Sampling and Analysis

For the 200-W-42 VCP, the surrounding soil, crib vent risers, and TEDF pipeline, samples will be collected from site locations where existing analytical data, process history, and/or field survey results indicate maximum contamination, or "worst case," concentrations are expected to establish the maximum concentrations of the contamination. The number of samples collected for a focused design will be determined judgmentally.

Because of the lack of process knowledge associated with the concrete pad adjacent to the 216-U-8 and 216-U-12 Cribs, random sampling will be performed. The pad will be divided into a grid (1 by 1 m [3- by 3-ft] sections) and random samples will be collected from the concrete to establish data for characterization. Because of the proximity of the concrete pad to the cribs and VCP, the list of COPCs and COCs in Table 1-2 will be used to guide characterization of the pad.

3.2 SAMPLING LOCATIONS AND FREQUENCY

Table 3-1 lists the sampling techniques and the samples required for the 200-UW-1 OU Support Activities project. Table 3-1 also summarizes the number of samples required for each location or media. While it is expected that the sample locations will be sampled once, all the sites or media are accessible and additional sampling may be conducted if the initial results prove to be insufficient to support site remediation decisions.

3.3 SAMPLING PROCESSES

The sampling processes to be implemented in the field shall be implemented consistent with the requirements outlined in the *Hanford Federal Facility Agreement and Consent Order Action Plan*, Section 7.8, "Quality Assurance." The project will use the WSCF Sampling and Mobile Laboratory organization or other approved sampling organization to perform the sample collection associated with the 200-UW-1 OU Support Activities project. The approved sampling organization will perform the sample collection activities in accordance with established instructions for sample collection, collection equipment, and sample handling.

3.4 SAMPLE MANAGEMENT

Sample and data management activities will be performed in accordance with the prime contractor quality assurance program. Sample preservation, container, and holding-time

requirements will be indicated on Chain-of-Custody/Sample Analysis Request forms in accordance with SW-846, and the specific analytical method prepared for specific sample events.

3.4.1 Sample Custody

All samples obtained during the project will be controlled from the point of origin to the analytical laboratory, as required by SW-846.

3.4.2 Sample Packaging and Shipping

Sample packaging and shipping will be addressed as described in Section 2.5.

3.4.3 Field Documentation

Sample preservation and container details will be addressed on the Chain-of-Custody/Sample Analysis Request form in accordance with the requirements specified in SW-846.

4.0 HEALTH AND SAFETY

All field operations will be performed in accordance with prime contractor health and safety requirements outlined in D&D-27507, *Health and Safety Plan to Support Activities for the 200-UW-1 Operable Unit*. In addition, a work control package will be prepared that will further control site operations. This work package will include an activity hazard analysis, and will reference applicable radiological control requirements.

The sampling processes and associated activities will take into consideration exposure reduction and contamination control techniques that will minimize radiation exposure to the sampling team, as required by minimum requirements established by 10 CFR 835, and provide the basis for consistent and uniform implementation of radiological control requirements.

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5.0 MANAGEMENT OF WASTE

All waste (including unexpected waste) generated by sampling activities will be managed in accordance with the waste management portion of the removal action work plan (DOE/RL-2005-78). Unused samples and associated laboratory waste for the analysis will be dispositioned in accordance with the laboratory contract and agreements for return to the project site. Pursuant to 40 CFR 300.440, Ecology Project Manager approval is required before returning unused samples or waste from offsite laboratories.

In addition, Ecology Project Manager approval is required before shipping sample waste from Hanford onsite laboratories (e.g., 222-S Analytical Laboratories or WSCF Sampling and Mobile Laboratory) back to the waste site of origination.

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